DRAFT

QUALITY ASSURANCE SAMPLING PLAN
WATER AND SEDIMENT SAMPLING AND MONITORING

FOR

GOLD KING MINE BLOWOUT

Prepared for

U.S. Environmental Protection Agency Region 6
Emergency Response Branch
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1. INTRODUCTION

The Superfund Technical Assessment and Response Team (START) contractor has been tasked by the U.S. Environmental Protection Agency (EPA) Region 6 Prevention and Response Branch (PRB) to conduct water and sediment sampling and water monitoring associated with the Gold King Mine Blowout in San Juan County, Colorado. Resulting mine drainage has flowed in a southern along Cement Creek and entering the Animas River toward the Colorado/New Mexico border thus entering EPA Region 6. The START field team will mobilize the equipment required for the emergency response initially from the EPA warehouses. Additional equipment will be provided through Weston- owned resources.

Sampling activities will consist of surface water and sediment sampling at specific locations downstream from the Gold King Mine site (the Site) on the Animas River. This QAPP has been prepared as part of the emergency response activities for the site.

The purpose of this QAPP is to describe site-specific tasks that will be performed in support of the stated objectives. This QAPP includes generic tasks common to all data collection activities including routine procedures for sampling and analysis, sample documentation, equipment decontamination, sample handling, data management, assessment, and data review.

1.1 PROJECT TEAM

The Project Team will be divided into multiple locations and multiple teams based upon site conditions and operations. As the operational situations change, sampling and monitoring teams and operations will adapt, based upon direction from the Unified Command. EPA OSCs and START from Region6 will have responsibility for sampling and monitoring in northwestern New Mexico. EPA will coordinate between parallel responses being conducted in Regions 6, 8 and 9.

1.2 PROBLEM DEFINITION

The Gold King Mine site consists of a mine adit and waste rock piles in the Cement Creek watershed. The mine historically discharged low pH, metals-laden water at a flow rate of approximately 100 gallons per minute (gpm). The water flowed through a concrete channel, through a Parshall flume, through a plastic conduit, over a steep waste rock pile, and either into the subsurface (low flow), or toward North Fork Cement Creek. A pond was constructed at the base of the waste rock pile to collect water during 2014 site activities. North Fork Cement Creek flows into Cement Creek, which discharges to the Animas River in Silverton, Colorado.

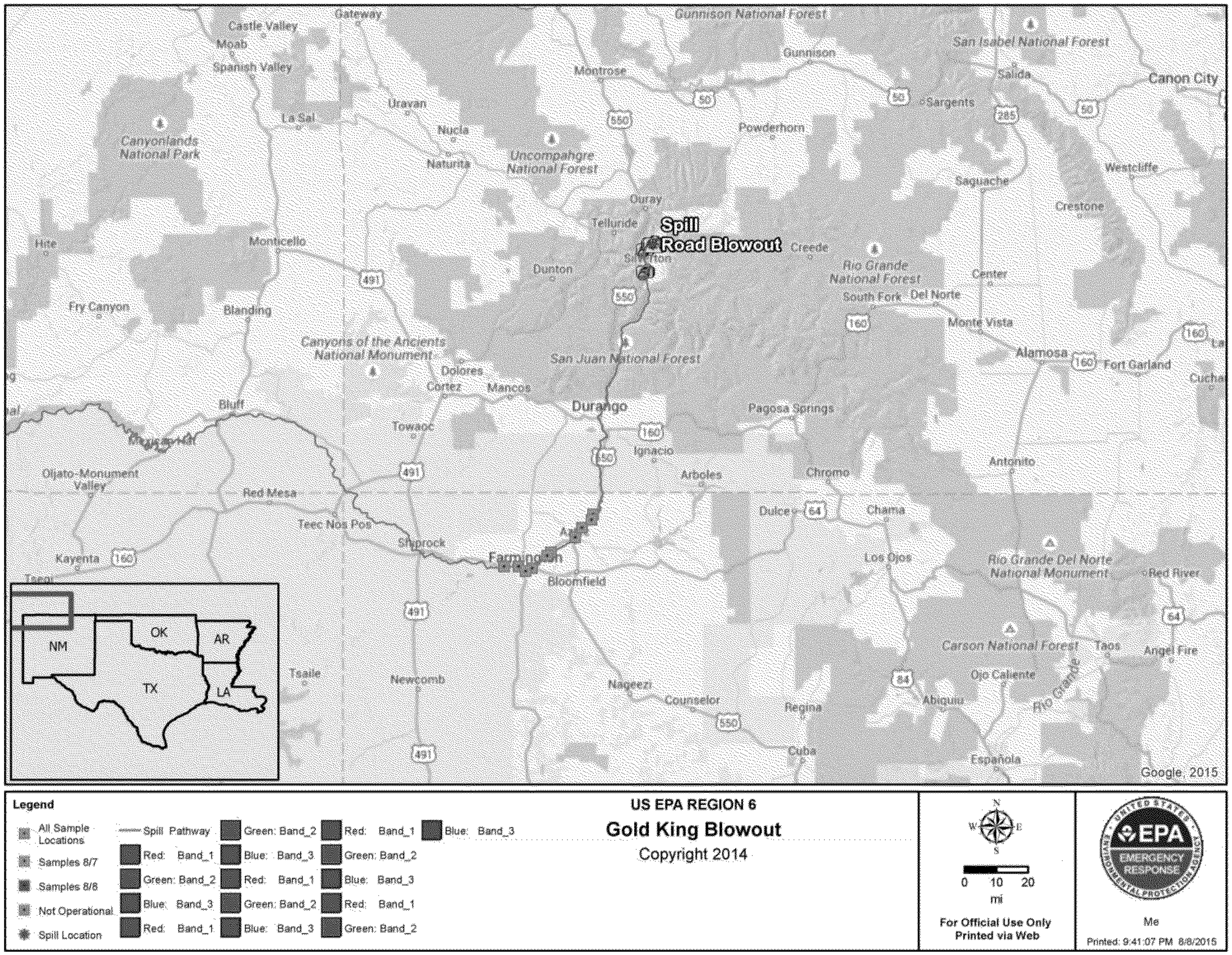
On August 5, 2015, approximately 1 million gallons of acidic metals-laden water was unexpectedly released from the Gold King Mine. The mine water flowed across the site and to Cement Creek and then to the Animas River in Silverton, Colorado. Historically, EPA and the State of Colorado Division of Mining Reclamation and Safety (DRMS) had been working to control the existing flow from the Gold King Mine along with similar discharge emanating from the nearby Red and Bonita mine site. The project team was setting up to incorporate the flow from the Gold King Mine into the ongoing treatment of the flow from the Red and Bonita Mine when water that had been dammed in the Gold King Mine behind a collapsed section of adit broke through rock and debris.

The primary environmental concern is the pulse of contaminated water containing sediment and metals flowing as an orange-colored discharge downstream through Durango, Colorado south across the New Mexico border towards Farmington, New Mexico. Several cities depend on daily withdrawals from the Animas River for their drinking water. The river is also used for recreational purposes, including fishing and rafting.

1.3 PROJECT OBJECTIVES

EPA Region 6 will assess the impacts of the Gold King Mine Blowout on the water and sediment quality of the Animas River as it flows from the Colorado border south into northwestern New Mexico. The incident overall objective is to protect the drinking water supply of the cities downstream of the Gold King Mine along the Animas River, and others who may be using the river for various purposes. EPA will collect surface water and sediment samples and will utilize multi-parameter water quality instruments.

Figure 1-1
Site Location



2. SITE DESCRIPTION

The Gold King Mine Blowout occurred in San Juan County, Colorado (37.8945° N, -107.6384° W) and is flowing downstream into La Plata County. The source is the Gold King Mine, which released into Cement Creek and is flowing downstream in the Animas River.

2.1 SITE HISTORY

The Red and Bonita Mine and the Gold King Mine are in the Cement Creek watershed, which originates high in the rugged San Juan Mountains of southwestern Colorado near the San Juan County and Ouray County line on the south slopes of Red Mountain Number 3 and the north slopes of Storm Peak.

The rugged and relatively inaccessible western San Juan Mountains were first prospected in the area around Silverton in 1860. The extension of the railroad from Silverton up Cement Creek to Gladstone in 1899 encouraged the mining of low grade ores, and the establishment of a lead-zinc flotation plant in 1917 allowed for the treatment of the low grade complex ores found in the area. Over a 100-year period between 1890 and 1991, mining activities in the upper Animas River Basin, including Cement Creek, produced the waste rock and mill tailings sources from which contamination spread throughout the surface water pathway. Over 18 million tons of ore were mined from the Upper Animas River Basin area, with more than 95 percent of this being dumped directly into the Animas River and its tributaries in the form of mill waste. Older waste rock piles and stope fillings were reworked and sent to mills as technology allowed lower grade ores to be processed economically. A great deal of abandoned waste was also milled during World War II when many older mining and milling structures were cannibalized for scrap metal. The last producing mine in the area was the Sunnyside Mine, which ceased production in 1991. The closing of the Sunnyside mine occurred after Lake Emma drained into the mine and out the American Tunnel into Cement Creek in 1978. The flood water from the Lake Emma "blow-out" was reported to have flowed down Cement Creek in a 10-foot wall of water that would have transported a large quantity of tailing and other mine waste down Cement Creek to the Animas River.

Numerous historic and now abandoned mines exist within a two-mile radius of Gladstone. They include: the Upper Gold King 7 Level, American Tunnel, Grand Mogul, Mogul, Red and Bonita, Evelyne, Henrietta, Joe and John, and Lark mines. Some of these mines have acid mine drainage that flows between 30 and 300 gpm directly or indirectly into Cement Creek and eventually into the Animas River. The confluence of Cement Creek and the Animas River is located approximately eight miles downstream of Gladstone.

2.2 BACKGROUND INFORMATION

Contaminants found in the Red and Bonita discharge water include low pH and metals. Cadmium concentrations from the mine discharge ranged from 33.3 micrograms per liter (µg/L) to 39.3 µg/L, copper concentrations ranged from 4.5 µg/L to 50.6 µg/L, iron concentrations range from 76,700 µg/L to 97,600 µg/L, lead concentrations ranged from 34 µg/L to 71.2 µg/L, and zinc concentrations ranged from 13,600 µg/L to 17,500 µg/L.

Contaminants in the Gold King discharge water include low pH and metals. From 2009 to 2011, cadmium concentrations from the mine discharge ranged from 38 micrograms per liter (µg/L) to 136 µg/L, copper concentrations ranged from 2400 µg/L to 12,000 µg/L, lead concentrations ranged from 2 µg/L to 29 µg/L, and zinc concentrations ranged from 14,500 µg/L to 44,700 µg/L.

3. PROJECT TASKS & SCHEDULE

Table 3-1
Project Tasks and Schedule

Activity	Responsible Party	Planned Start Date	Planned Completion Date	Deliverable(s)	Deliverable Due Date
Project Initiation	EPA/START	August 6, 2015	August 6, 2015	N/A	August 6, 2015
Develop a QAPP for Emergency Response	START	August 7, 2015	August 9, 2015	QAPP for Emergency Response Activities	August 9, 2015
Develop Health and Safety Plan (HASP)	START	August 6, 2015	August 6, 2015	HASP	N/A
Mobilization/Demobilization	START	August 6, 2015	August 6, 2015	Field Notes	N/A
Sample Collection Tasks	START	August 7, 2015	TBD	Field Notes	TBD
Analytical Tasks	START/ Laboratory	August 6, 2015	TBD	Field Notes/Laboratory Reports	TBD
Quality Control Tasks	START	August 6, 2015	TBD	Report of Analyses/Data Package	TBD
Validation	START	August 6, 2015	TBD	Validation Summary Report	TBD

3.1 HEALTH AND SAFETY IMPLEMENTATION

The monitoring will be conducted in accordance with the site-specific health and safety plan (HASP). START personnel will conduct air monitoring in Level D personal protective equipment (PPE) as stated in the site HASP. The Field Safety Office (FSO) will be responsible for implementation of the HASP during this assessment and clean-up action. In accordance with the START general health and safety operating procedures, the START personnel will drive the route to the hospital specified in the HASP prior to initiating sampling activities.

4. SAMPLING APPROACH AND PROCEDURES

Samples collected by EPA will be used to evaluate the nature of the contaminants present. EPA will collect water and sediment samples as necessary, including background water and sediment sampling in northwestern New Mexico. Samples collected as part of this emergency response (ER) will be obtained in accordance with START Standard Operating Procedures (SOPs).

4.1 OVERVIEW OF SAMPLING ACTIVITIES

EPA will conduct surface water and sediment samples at specific locations. Sample locations will be determined in coordination with the EPA Region 6 OSCs. START will use EPA Scribe Environmental Sampling Data Management System (SCRIBE) software to manage sample data. Data will be managed according to the Data Management Plan developed for this response by the START Region 6 Data Team (Appendix A).

4.2 DATA QUALITY OBJECTIVES

The objective of surface water and sediment sampling is to characterize any impacts from the acid mine waste spill to the natural resources and ecosystems along the Animas River. The goal is to obtain sufficient samples to support a comparison of the water and sediment quality to the the benchmarks outlined by EPA Region 6 (Appendix B). The following outline the data quality objective process for this QAPP.

STATE THE PROBLEM

On August 5, 2015, approximately 1 million gallons of acidic metals-laden water and sludge was unexpectedly released from the Gold King Mine. The mine water flowed across the site and to Cement Creek and then to the Animas River in Silverton, Colorado and downstream into New Mexico.

EPA has requested that Region 6 START assist to:

- Collect samples from areas potentially affected by the release, including surface water, sediment, groundwater, and/or soil
- Provide GPS data for sampling locations
- Provide georeferenced site photo documentation

IDENTIFY THE GOALS OF THE STUDY

The goals of the study are to:

- Determine the impact of the release on downstream waters and water users.

The primary study questions are:

- What areas were affected by the release from Gold King Mine?
- What are the water quality conditions, as indicated by field and laboratory analyses, in the Animas River?
- Based on laboratory analyses, are other media such as sediment, soil or groundwater affected by the mine water release?

IDENTIFY INFORMATION INPUTS

To support the above objectives, the following data will be collected:

- Surface water and sediment samples will be collected and analyzed for metals. If needed, groundwater and soil may also be sampled.
- Field measurements of surface water and/or groundwater quality.
- Geospatial data of sampling locations.
- Field documentation and photographs of site activities.

DEFINE THE BOUNDARIES OF THE STUDY

Spatial Boundaries: The study area includes the downstream locations in New Mexico potentially impacted from the Gold King release.

Temporal Boundaries: The study will represent conditions from after the release from the Gold King Mine and ending at an as yet undetermined date.

Practical constraints on data collection: Scheduling adjustments will be made if physical constraints on planned field events occur due to weather, safety considerations, site access or problems that may impact the technical quality of the measurements.

DEVELOP THE ANALYTIC APPROACH

Samples will be collected from locations designated in the field by an EPA OSC. Samples will be sent for laboratory analysis of total and dissolved TAL metals and other parameters as directed by the OSC.

The results may be compared to Water Quality Standards determined by EPA and the State of New Mexico, and/or other benchmarks as directed by the EPA OSC.

SPECIFY PERFORMANCE OR ACCEPTANCE CRITERIA

All data will be reviewed and verified to ensure that they are acceptable for the intended use. Data will be validated at the request of the EPA OSC.

Decision errors will be limited to the extent practicable by following approved U.S. EPA methods and applicable SOPs. Deviations from the QAPP will be documented.

DEVELOP THE DETAILED PLAN FOR OBTAINING DATA

Water and sediment samples will be collected at locations designated by the EPA OSC.

Field water quality parameters will be obtained using a Hanna, YSI, and/or Horiba or similar water quality meter. Field monitoring will be used to measure the quality of water, with emphasis on pH measurements. Visual observations of water clarity will be recorded.

Data from the laboratories will be delivered in an electronic data deliverable and reported in the emergency response report. A site-specific Data Management Plan is provided in Appendix A.

4.3 SAMPLING DESIGN AND RATIONALE

The DQOs assist in creating a sampling design and the rationale for sample collection. START will collect surface water samples to characterize water quality and flow impacts from the Gold King Mine release. Surface water will be monitored periodically for pH. Other water quality parameters such as conductivity, turbidity, dissolved oxygen and oxidation reduction potential will be measured as long as the additional information is helpful in evaluating site conditions.

Additional media such as sediment, soil and/or groundwater may also be sampled, as directed by the EPA OSC.

This project involves the collection of laboratory samples and field screening data. Sample points will be located with a Global Positioning System (GPS) device to be used for mapping purposes and to document sample locations selected in the field. If sampling locations become inaccessible, alternate sampling locations which provide similarly adequate or sufficient data as the original will be identified and sampled based upon the best judgment of the inspector/sampler, if necessary.

4.3.1 Sample Locations

Sample locations will be identified in the field in coordination with the EPA OSC. In general, the sampling area extends along the Animas River south of the New Mexico border. The priority and importance of each sample will be determined by the OSC.

4.3.2 Sampling/Monitoring Approach

All surface water and sediment samples will be collected in general accordance with the START SOPs 1002-01, SOP for Surface Water Sample Collection and SOP 1002-04, for Sediment Sampling. In addition to these SOPs, EPA's Environmental Response Team SOP #2013 Surface Water Sampling and SOP, #2016 Sediment Sampling and the Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analysis: Technical Manual will be consulted. Although specific sampling procedures are outlined in the SOPs, it should be noted that water samples will be collected prior to sediment samples to avoid cross contamination. SOPs are included in Appendix C and the specific sampling procedures are described below.

4.3.2.1 Surface Water Sampling

START personnel will collect surface water samples as directed by EPA. . Surface water samples will be submitted to a qualified subcontracted commercial laboratory for the following analyses:

- Total and Dissolved TAL metals plus molybdenum (EPA 200.7, EPA 200.8, and EPA 245.1)
- Hardness by calculation (SM2340B)
- TSS (SM2540D)
- TDS (SM2540C)
- pH (SM4500H+B)
- Alkalinity (SM2320B)

The laboratory-specific analyte list will be presented as Appendix B.

4.3.2.2 Surface Water Quality Monitoring

Surface water quality parameters will be collected at each surface water sample location. These parameters will be collected using a Multi-parameter Water Quality real-time monitor. Measurements may not be possible at all locations. Site conditions and professional judgement will be used to assess whether monitoring can take place at a location or if the area is too contaminated to collect for readings. The data collected will be electronically logged when possible, or written out in the field logbook. Data collected will include:

- pH (0-14 standard units)
- Conductivity (Siemens/meter)
- Dissolved Oxygen (milligrams/liter)
- Turbidity (NTU)
- oxidation/reduction potential (ORP)

Water Quality instruments will be used according to manufacturers directions and standard operating procedures (SOPs). The monitors will be field calibrated prior to use or in the event of a change of sensors.

4.3.2.3 Sediment Sampling

Sediment samples will be collected by START personnel according to SOPs and using equipment most appropriate to the site circumstances. Samples will be collected to obtain data on areas which may be impacted by the mine waste water release. Sediment and water samples will be collected at the locations determined by the EPA OSC. The OSC or the START Project Team Leader (PTL) will make the decision on the alternate sampling points. The collected sediment samples will be submitted to a qualified subcontracted commercial laboratory for the following analyses:

- TAL metals and molybdenum (EPA 6010C, EPA 6020A, and EPA 7471A)

Laboratory-specific analyte lists and reporting limits are included in Appendix B. Deviations from the sample locations will be due to new observations made prior to sampling, information obtained in the field that warrants an altered sampling point, difficulty in sample collection, or limited access. The EPA OSC will be notified, and concurrence will be obtained should significant deviations from the planned sampling points be proposed. Details regarding deviations of the QASP will be documented in the site logbook.

4.3.3 Sampling and Field QC Procedures

Samples will be collected using equipment and procedures appropriate to the matrix, parameters, and sampling objectives. The volume of the sample collected will be sufficient to perform the analysis requested. Samples will be stored in the proper types of containers and preserved in a manner for the analysis to be performed per laboratory guidelines. Sampling activities performed on site will follow all applicable SOPs outlined in Appendix C, including EPA ERT SOP 2001 "General Field Sampling Guidelines". Sampling is anticipated to be performed in Level D personal protective equipment (PPE).

Field water quality parameters will be obtained using a Hanna, YSI, and/or Horiba water quality meter. Field monitoring will be used to measure the quality of water discharged from the treatment system, with emphasis on pH and turbidity measurements. Visual observations of water clarity will be recorded.

Dedicated sampling equipment, sample containers, and PPE will be maintained in a clean, segregated area. Personnel responsible for sampling will change gloves between each sample collection/handling activity. Personnel will use unpowdered nitrile gloves as some types of powder in the powdered gloves contain zinc which could potentially contaminate samples.

START personnel will collect field duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples of surface water and QA/QC samples as needed during the sampling activities. QA/QC samples will be collected according to the following dictates:

- Blind field duplicate soil samples will be collected during sampling activities at locations selected by the START-3 PTL. The data obtained from these samples will be used to assist in the quality assurance of the sampling procedures and laboratory analytical data by allowing an evaluation of reproducibility of results. Efforts will be made to collect duplicate samples in locations where there is visual evidence of contamination or where contamination is suspected. One duplicate sample will be collected for this sampling activity. In general blind field duplicate samples are collected at the rate of one duplicate for every 10 samples collected.
- Field Blank - Field blanks will be prepared by pouring laboratory-grade de-ionized water into pre-cleaned laboratory-grade sample containers for analysis. These samples will be prepared to demonstrate the impact the surrounding environment is having on the samples being collected. Field blank samples will be collected once per day for this particular scope of work.
- Temperature Blanks - Each sample cooler shall contain a temperature blank. The temperature blank should be supplied by the receiving laboratory and can be either a 40-ml volatile organic compound (VOC) vial or a 100-ml plastic bottle filled with reagent grade water. The purpose of the temperature blank is to document the temperature of the representative solution contained within the same transport cooler as the collected field sample.
- Equipment Rinsate Blanks - Rinsate blanks will be prepared by pouring laboratory grade de-ionized water over non-disposable sampling equipment after it has been

decontaminated and by collecting the rinse water in sample containers for analyses. These samples will be prepared to demonstrate that the equipment decontamination procedures for the sampling equipment were performed effectively. It is anticipated that enough pre-cleaned disposable equipment will be available and that the collection of an equipment rinsate blank is not anticipated to be collected during this sampling event. However, if field conditions change an equipment rinsate blank will be collected following equipment decontamination procedures.

- Matrix spike samples will be collected during sampling activities at locations selected by the START-3 PTL. The data obtained from these samples will be used to assist in the quality assurance of the laboratory analytical procedure. Matrix spiking ensures that the laboratory is able to extract an acceptable percentage of a spiked constituent. At the direction of EPA, one matrix spike sample may be collected for every 20 samples submitted for analysis. The matrix spiking analysis often duplicates the spiking procedure on a separate sample volume.

4.3.4 Investigation-Derived Wastes

Attempts will be made to eliminate or minimize the generation of investigation-derived waste (IDW) during this investigation. Non-dedicated equipment will be rinsed with soap and water and attempts will be made to dispose of decontamination fluids on-site. The analytical data from collected samples will be reviewed after completion of the field activities, and disposal options will be evaluated accordingly. It is anticipated that minimal amounts of IDW will be generated during this activity.

4.3.5 Sampling and Sample Handling Procedures

Samples will be collected using equipment and procedures appropriate to the matrix, parameters, and sampling objectives. The volume of the sample collected must be sufficient to perform the laboratory analysis requested. Samples must be stored in the proper types of containers and preserved in a manner appropriate to the analysis to be performed. A sample collection and analyses summary table (Table 4-1) is presented following Section 4.

All clean, decontaminated sampling equipment and sample containers will be maintained in a clean, segregated area. All samples collected for laboratory analysis will be placed directly into pre-cleaned, unused glass or plastic containers. Sampling personnel will change gloves between each sample collection/handling. All samples will be assembled and catalogued prior to shipping to the designated laboratory.

4.4 SAMPLE MANAGEMENT

Specific nomenclature that will be used by START personnel will provide a consistent means of facilitating the sampling and overall data management for the project. The START Field Team Leader must approve any deviations from the sample nomenclature proposed below.

As stated in START SOP 0110.05, sample nomenclature will follow a general format regardless of the type or location of the sample collected.

The sediment sample nomenclature consists of the following components:

Area of Concern – ID – Depth - Collection Type + QC Type

Where:

Area of Concern: A four-digit identifier used to designate the particular Area of Concern (AOC) that the location where the sample was collected.

ID: A three letter &/or digit identifier used to designate the particular location (i.e. grid A01, P06, or 055) in the AOC from which the sample was collected or the center of the composite sample.

Depth: A two-digit code used to designate what depth of sample was collected

code	Assessment	Confirmation
00	0 to 0 Surface	N/A
03	0 to 3 inches	3 inches below original ground surface
06	3 to 6 inches	6 inches below original ground surface
12	6 to 12 inches	12 inches below original ground surface

Collection Type: A one-digit code used to designate what type of sample was collected:

1	Surface Water	6	Oil
2	Ground Water	7	Waste
3	Leachate	8	Other
4	Field QC/water sample	9	Drinking Water
5	Soil/Sediment		

QC Type: A one-digit code used to designate the QC type of the sample:

1	Normal
2	Duplicate
3	Rinsate Blank
4	Trip Blank

5	Field Blank
6	Confirmation, Normal
7	Confirmation, Duplicate

The water sample nomenclature consists of the following components:

WELL OR STATION – YYMMDD - Collection Type + QC Type

Where:

Well or Station: For Wells and boreholes always assume there will be 10 or more so Monitoring Well 1 becomes designated MW01 or MW-01. If it is anticipated that there will be over 100 wells designate Monitoring Well 1 as MW001 or MW-001. For stations along a water pathway use stations from the furthest most upstream point and travel downstream in 100 ft. increments (i.e. point of probable entry would be Station 0+00 or ST000; 525 ft. downstream would be 5+25 or ST525)

YYYYMMDD: A four-digit year + two-digit month + two-digit day

Collection Type: A one-digit code used to designate what type of sample was collected

QC Type: A one-digit code used to designate the QC type of the sample

Sample data management will be completed utilizing SCRIBE including Chain-of-Custody (COC) and sample documentation needs.

4.5 SAMPLE PRESERVATION, CONTAINERS, AND HOLD TIMES

Water samples will be stored in coolers at 4 degrees centigrade (C), on-site until shipped for laboratory analysis. The samples will be shipped via common carrier to the laboratory or driven by START members.

This turnaround time (TAT) is initiated when the samples are collected in the field and continues until the analytical results are made available to START either verbally or by providing facsimile or email copies of the results for review. All samples that have been analyzed will be disposed by the designated laboratory in accordance with the laboratory SOPs.

Table 4-1
Requirements for Containers, Preservation Techniques, Volumes, and Holding Times

Name	Analytical Methods	Matrix	Container	Preservation	Minimum Volume or Weight	Maximum Holding Time
Total Metals and Mercury plus hardness by Calculation	Metals: EPA Methods 200.7, 200.8, and 245.1 Hardness: SM2340B	Water	Polyethylene (water)	HNO_3 to pH<2 (water), 4°C	1 x 250 mL	28 days for mercury 180 days all other metals
Dissolved Metals and Mercury	EPA Methods 200.7, 200.8, and 245.1	Water	Polyethylene (water)	Field Filtered: /HNO_3 to pH<2 (water), 4°C *If not field filtered then no preservative*	1 x 500- mL	28 days for mercury 180 days all other metals
Total Dissolved Solids	SM2540C	Water	Polyethylene (water)	4°C	1 x 250-mL (or may be included with Dissolved metals if not preserved)	7 days
Total Suspended Solids	SM2540D	Water	Polyethylene (water)	4°C	1 x 1-L	7 days
pH	SM4500H+B	Water	Polyethylene (water)	4°C	1 x 250-mL	ASAP
Alkalinity	SM2320B					14 days
Total Metals and Mercury	EPA 6010C, 6020A, and 7471A	Soil/ Sediment	Glass widemouth jar	4°C	1 x 4 oz	28 days for mercury 180 days all other metals

SM = Standard Methods for the Examination of Water & Wastewater
ASAP = As soon as possible

Table 4-2
Sampling Locations and Methods

Sampling Location / ID	Matrix	Depth (units)	Type	Analyte/Analytical Group	Sampling SOP Reference[1]	Comments
Site ID_mmddyy	Surface Water	TBD	Grab	Metals, Alkalinity, Total Suspended Solids, Total Dissolved Solids, pH		
GKMSW##_mmddyy	Surface Water	TBD	Grab	Metals, Alkalinity, Total Suspended Solids, Total Dissolved Solids, pH		
GKMSD##_mmddyy	Sediment	TBD	Grab/Composite	Metals		
GKMGW##_mmddyy	Groundwater	Unknown	Discrete	Metals, Alkalinity, Total Suspended Solids, Total Dissolved Solids, pH		Groundwater/Well type will be defined by addition of type ID in sample ID nomenclature.

Table 4-3
Field Quality Control Sample Summary

Matrix	Analyte/Analytical Group	No. of Field Samples[1]	No. of Field Duplicates	No. of MS/MSD	No. of Field Blanks	No. of Equip. Blanks	No. of Trip Blanks	No. of Other	Total No. of Samples to Laboratory
Surface water	Total Metals	TBD	1 per 10	1 per 20 or 1 per day	1 per 20 or 1 per day	1 per 20 if using non-disposable equipment	0	0	TBD
Surface water	Dissolved Metals	TBS	1 per 10	1 per 20 or 1 per day	1 per 20 or 1 per day	1 per 20 if using non-disposable equipment	0	0	TBD
Groundwater	Total Metals	TBD	1 per 10	1 per 20 or 1 per day	1 per 20 or 1 per day	1 per 20 if using non-disposable equipment	0	0	TBD
Groundwater	Dissolved Metals	TBS	1 per 10	1 per 20 or 1 per day	1 per 20 or 1 per day	1 per 20 if using non-disposable equipment	0	0	TBD
Sediment	Total Metals	TBD	1 per 10	1 per 20 or 1 per day	1 per 20 or 1 per day	1 per 20 if using non-disposable equipment	0	0	TBD

[1] Samples that are collected at different depths at the same location, and analyzed separately, will be counted as separate field samples. Even if they are taken from the same container as the parent field sample, MS/MSDs are counted separately, because they are analyzed separately. If composite samples or incremental samples are collected, only the sample that will be analyzed will be included; subsamples and increments will not be listed separately.

[2] Total number of samples to the laboratory does not include MS/MSD samples.

Note: If EPA requests that field samples be collected from treatment system water and analyzed for total and dissolved metals, the need for a duplicate will be determined based on the rationale for sampling. The number and types of QC samples will be based on project-specific DQOs and this table will be adapted, as necessary, to accommodate project-specific requirements.

5. ANALYTICAL APPROACH

5.1 LABORATORY ANALYSIS

The water and sediment samples will be submitted to a qualified subcontracted commercial laboratory for the following analyses with a turn-around-time of 24 hours for analytical results.

Water

- Total Metals and Mercury by EPA Methods 200.7, 200.8, and 245.1
- Hardness by SM2340B
- Dissolved Metals and Mercuryby EPA Methods 200.7, 200.8, and 245.1
- Total Dissolved Solids by SM2540C
- Total Suspended Solids by SM2540D
- pH bySM4500H+B
- Alkalinity by SM2320B

Sediment

- TAL metals and molybdenum (EPA 6010C, EPA 6020A, and EPA 7471A)

The START team will indicate on the Chain of Custody that a Level IV data package is required. The lab shipping information is as follows:

TestAmerica Laboratories, Inc. - Savannah
5102 LaRoche Avenue
Savannah, GA 31404
(912) 354-7858

Deliverables will include preliminary data via email in pdf format and an Electronic Data Deliverable (EDD) in excel format and an electronic deliverable. The final data deliverable will include a full Level IV "Contract Laboratory Program (CLP) like" data package in PDF format and a final EDD in excel format.

5.2 MEASUREMENT PERFORMANCE CRITERIA TABLES

The following are generic examples for Inorganics for all media.

Matrix: All
Analytical Group or Method: Inorganics
Concentration Level: All

DQI	QC Sample or Measurement Performance Activity	MPC
Field Precision	Field Duplicate	1 per 10 samples RPD determined on a sampling method-specific basis
Field Representativeness/ Accuracy/Bias	Equipment Rinsate Blank	1 per 20 samples/matrix or 1 per day <½ LOQ
Accuracy/Bias	MS/MSD	1 per 20 samples per matrix RPD <20%
Laboratory Precision	Laboratory Duplicate	1 per 20 samples per matrix RPD <20%
Accuracy/Precision	Initial Calibration	Daily prior to sample analysis (minimum 1 standard and a blank)
Accuracy/Bias	Initial Calibration Verification	Daily after initial calibration All analytes within ±10% of expected value
Accuracy/Bias	Calibration Blank (CB) Initial Calibration Blank/Continuing Calibration Blank (ICB/CCB)	After every calibration/verification No analytes detected ≥ Limit of Detection (LOD)
Precision/Accuracy	Calibration Verification (Instrument Check Standard)	At beginning of analytical sequence, after every 10 samples and at the end of the analysis sequence All analytes within ±10% of expected value and RSD of replicate integrations <5%
Precision	Interference Check Solution	At beginning of analytical run ± 20% of the expected value
Precision/Accuracy	Serial Dilution	Method-specific
Accuracy/Bias	Post Digestion Blank	Each digestion batch %R. Analyte-specific
Laboratory Representativeness/ Accuracy/Bias	Method Blank	1 per batch per matrix or 1 per 20 samples, whichever is more frequent No analyte ≥ RL
Laboratory Accuracy/ Sensitivity	LCS	1 per batch per matrix or 1 per 20 samples, whichever is more frequent No analyte ≥ LOQ

5.3 SECONDARY DATA USES AND LIMITATIONS

Sources and types of secondary data include but are not limited to the following:

Data Type	Data Source (originating organization, report title and date)	Data Uses Relative to Current Project	Factors Affecting the Reliability of Data and Limitations on Data Use
Soils	United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Web Soil Survey and Soil Data Mart	Identify soil types, composition, elevation, precipitation, setting, properties and qualities, profile, land capability and farmland classification	
Geology/Hydrology	United States Department of the Interior Geologic Survey (USGS) Topographic and Geologic Maps, State Agencies/EPA My WATERS Mapper	Identify area Geology, topography, surface water bodies, hydrologic units/watersheds, water quality, etc.	
Streams/Drainages	EPA My WATERS Mapper and USGS Topographic Maps	Topography, surface water bodies, hydrologic units/watersheds, water quality, etc.	
Registered Wells	State Databases	Identify well locations, drinking water wells, and groundwater use	
Meteorological	National Weather Service	Seasonal fluctuations in storm water runoff	
Property Boundaries	County Assessor and Plat Maps	Identify property boundaries to determine site requirements for assessment	
Environmentally Sensitive Areas	U.S. and State Fish & Wildlife Service Maps, Publications, and Databases	Identify sensitive and endangered species and environments potentially present on or in removal action/emergency response area	
Wetlands	USDA NRCS Web Soil Survey and Soil Data Mart (Hydric Soils List), and U.S. and State Fish & Wildlife Databases	Identify wetlands and associated sensitive and endangered species and environments potentially present on or in removal action/emergency response area	
Historical and Current Site Use and Investigations	Historical Records, Previous Investigations, Visual Site Reconnaissance, and Interviews	Supplemental background information on historical site use and current site conditions, and previous investigations	

The project team will carefully evaluate the quality of secondary data (in terms of precision, bias, representativeness, comparability, and completeness) to ensure they are of the type and quality necessary to support their intended uses. When evaluating the reliability of secondary data and determining limitations on their uses, the project team will consider the source of the data, the time period during which they were collected, data collection methods, potential sources of uncertainty, the type of supporting documentation available, and the comparability of data collection methods to the currently proposed methods. With respect to secondary analytical data that will be utilized to support critical decisions, such as comparison of contaminant levels with applicable standards, a detailed review of the data will be necessary to determine the usability of the data. In addition to the qualitative rating of the data source, the project team should complete a data quality review and document the review in a data usability summary.

5.4 DATA VALIDATION

START will validate the analytical data based Level IV deliverable generated by the outside laboratories using EPA-approved validation procedures in accordance with the EPA CLP Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review. A summary of the data validation findings will be presented in Data Validation Summary Reports as part of the final report. START will evaluate the following applicable parameters to verify that the analytical data is within acceptable QA/QC tolerances:

- The completeness of the laboratory reports, verifying that required components of the report are present and that the samples indicated on the accompanying chain-of-custody are addressed in the report.
- The results of laboratory blank analyses.
- The results of laboratory control sample (LCS) analyses.
- The results of matrix spike/matrix spike duplicate (MS/MSD) analyses.
- The results of surrogate recovery analyses.
- Laboratory precision, by reviewing the results for blind field duplicates.

Variances from the QA/QC objectives will be addressed as part of the Data Validation Summary Reports.

Validation will be performed on all laboratory analytical data unless a defined quantity or percentage of samples is identified by the U.S. EPA in the Technical Direction Document or during the project scoping meeting on a project-specific basis.. WESTON-contracted laboratory data packages will be verified and validated using a Stage 2A validation, as described in the EPA *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (January 2009) unless otherwise specified by the U.S. EPA WAM/COR during the development of the DQOs. Validation Qualifiers will be applied using the following hierarchy: Region 8 UFP-QAPP for Removal Actions and Emergency Responses; the site-specific SAP, and/or QAPP; *EPA National Functional Guidelines for Organic Data Review* (Appendix K); *EPA National Functional Guidelines for Inorganic Data Review* (Appendix L); EPA Publication SW-846; and the laboratory-specific SOP. Methods for which no data validation guidelines exist will be validated following the guidance deemed most appropriate by the data validator.

The data validator will receive all laboratory packages and analytical results electronically. Additionally, the validator will be required to submit final validation reports via PDF format and must provide an annotated laboratory analytical result electronic data deliverable (EDD) with applicable data validation qualifiers (Appendix M) identified in the site-specific SAP, and/or QAPP, and/or result value modifications. The Delegated QA Manager will use EPA document *Using Qualified Data to Document an Observed Release and Observed Contamination* (July 1996) to aid in determining the use of qualified data to document all observed release and observed contamination by chemical analysis under U.S. EPA's HRS. Approved data will be released by the Delegated QA Manager for reporting.

5.5 DATA USABILITY ASSESSMENT

Personnel (organization and position/title) responsible for participating in the data usability assessment may include, but not be limited to:

- WESTON PM;
- WESTON Delegated QA Manager;
- WESTON Risk Assessor;
- WESTON Chemist;
- WESTON PTL;

Based on project-specific oversight responsibilities and analytical scopes, this data usability assessment outlines the approach that will be taken as the analytical scope expands on a project-specific basis. The following general steps will be followed to assure that the data usability assessment evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence:

- Step 1 – Review the project's objectives and sampling design;
- Step 2 – Review the data verification and data validation outputs;
- Step 3 – Verify the assumptions of the selected statistical method;
- Step 4 - Implement the statistical method;
- Step 5 – Document data usability and draw conclusions.

The data usability assessment is considered the final step in the data evaluation process; all data will be assessed for usability, regardless of the data evaluation/validation process implementation. Data usability goes beyond validation in that it evaluates the achievement of the DQOs based on the comparison of the project DQIs and individual study-specific work plans, with the obtained results. The results of the data usability assessment, and particularly any changes to the DQOs necessitated by the data not meeting usability criteria, will be reported in the data summary.

Primarily, the assessment of the usability will follow procedures described in appropriate EPA guidance documents, particularly Guidance for Data Usability in Risk Assessment (Publication No. 9285.7-05FS, September 1992) (Appendix U), and will be conducted according to the process outlined below.

1. **Sampling and Analysis Activities Evaluation**: The first part of the data usability evaluation will include a review of the sampling and analysis activities in comparison to project-specific DQIs and study-specific work plans. Specific limitations to the data (i.e., results that are qualified as estimated [J/UJ], or rejected [R], will be determined and documented in the database).
2. **Achievement of DQIs**: The second part of data usability pertains to the achievement of the program-specific DQIs. Each investigator will compare the performance achieved for each data quality criterion against the expected and planned performance. In general, this comparison will follow from the DQIs used to define each DQO. This comparison is the most critical component of the assessment process. Any deviation from planned performance will be documented and evaluated to determine whether corrective action is advisable. Potential corrective actions will range from re-sampling and/or reanalysis of data, to qualification or exclusion of the data for use in the data interpretation. In the event that corrective action is not possible, the limitations, if any, of the data with regard to achieving the DQOs will be noted.

   In conjunction with the DQI achievement review, the investigators will need to make decisions for the use of qualified values, which are a consequence of the formalized evaluation/validation process. Data qualifiers will be applied to individual data results. Data usability decisions will be made based on the assessment of the usability of each of these results for the intended purpose. Evaluation will describe the uncertainty (bias, imprecision, etc.) of the qualified results. Cumulative QC exceedances from the DQIs may require technical judgment to determine the overall effect on the usability of the data. Decisions about usability of qualified data for use in risk assessment will be based on the EPA document mentioned, which allows for the use of estimated values. Finally, data users may choose to determine final data usability qualifiers as a result of this overall examination and decision process.
3. **Achievement of DQOs**: The final part in the data usability process concerns achievement of the DQOs. Once the data set has been assessed to be of known quality, data limitations have been documented, and overall result applicability/usability for its intended purpose has been determined, the final data assessment can be initiated by considering the answers to the following questions:

   - Are the data adequate to determine the extent to which hazardous substances have migrated or to what extent they were expected to migrate from potential hazardous substance source areas?

  - Do the data collected adequately characterize the nature and extent of potential hazardous substance source areas at the site?
  - Are the data statistically adequate to evaluate on a per chemical and per media basis?
  - Do the data collected allow assessment of hydrogeologic factors, which may influence contaminant migration/distribution?
  - Do laboratory reporting limits attain the applicable state and/or federal standards and/or screening levels?
  - Is the sample set sufficient to develop site-specific removal and disposal treatment methodologies?
- Have sufficient data been collected to evaluate how factors including physical characteristics of the site and climate and water table fluctuations affect contaminant fate and transport?
- Have sufficient data been collected to determine the toxicity, environmental fate, and other significant characteristics of each hazardous substance present?
- Is the data set sufficient to evaluate the potential extent and risk of future releases of hazardous substances, which may remain as residual contamination at the source facility?

Principal investigators, in conjunction with the project team, will formulate solutions if data gaps are found as a result of problems, biases, trends, etc., in the analytical data, or if conditions exist that were not anticipated in the development of the DQOs. It is particularly important that each data usability evaluation specifically address any limitations on the use of the data that may result from a failure to achieve the stipulated DQO.

If the project scope changes, the DQOs will be expanded. The DQOs will address the specific action limits and measurable performance criteria, in order to make appropriate decisions on the analytical data.

DQIs, such as precision, accuracy, completeness, representativeness, and comparability measurements, aid in the evaluation process and are discussed below.

Precision

The most commonly used estimates of precision are the RPD for cases in which only two measurements are available, and the percent RSD (%RSD) when three or more measurements are available. This is especially useful in normalizing environmental measurements to determine acceptability ranges for precision because it effectively corrects for the wide variability in sample analyte concentration indigenous to samples.

Precision is represented as the RPD between measurement of an analyte in duplicate samples or in duplicate spikes. RPD is defined as follows:

$$\text{RPD} = \frac{|C_1 - C_2|}{\frac{C_1 + C_2}{2}} \text{ x } 100$$

Where:

C_1 = First measurement value
C_2 = Second measurement value

For field measurements such as pH, where the absolute variation is more appropriate, precision is often reported as the absolute range (D) of duplicate measurements:

$$\%D = m1 - m2$$

Where:

$m1$ = First measurement value
$m2$ = Second measurement value

The % RSD is calculated by the standard deviation of the analytical results of the replicate determinations relative to the average of those results for a given analyte. This method of precision measurement can be expressed by the formula:

$$\%\text{RSD} = \frac{\sqrt{\sum_{I-1}^{N}\left(\frac{\text{RF}_i - \text{RF}}{\text{N - 1}}\right)}}{\text{RF}} \text{ x } 100$$

Where:

RF = Response factor
N = Number of measurements

Precision control limits for evaluation of sample results are established by the analysis of control samples. The control samples can be method blanks fortified with surrogates (e.g., for organics), or LCS purchased commercially or prepared at the laboratory. The LCS is typically identified as blank spikes (BS) for organic analyses. For multi-analyte methods, the LCS or BS may contain only a representative number of target analytes rather than the full list.

The RPD for duplicate investigative sample analysis provides a tool for evaluating how well the method performed for the respective matrix.

Accuracy/Bias

Accuracy control limits are established by the analysis of control samples, which are in water and/or solid/waste matrices. For organic analyses, the LCS may be a surrogate compound in the blank or a select number of target analytes in the blank spike. The LCS is subjected to all sample preparation steps. When available, a solid LCS may be analyzed to demonstrate control of the analysis for soil. The amount of each analyte recovered in an LCS analysis is recorded and entered into a database to generate statistical control limits. These empirical data are compared with available method reference criteria and available databases to establish control criteria.

The %R for spiked investigative sample analysis (e.g., matrix spike) provides a tool for evaluating how well the method worked for the respective matrix. These values are used to assess a reported result within the context of the project data quality objectives. For results that are outside control limits provided as requirements in the QAPP, corrective action appropriate to the project will be taken and the deviation will be noted in the case narrative accompanying the sample results. Percent recovery (%R) is defined as follows:

$$\%\,\text{Recovery} = \frac{(A_T - A_0)}{A_F} \times 100$$

Where:

A_T = Total amount recovered in fortified sample
A_0 = Amount recovered in unfortified sample
A_F = Amount added to sample

Accuracy for some procedures is evaluated as the degree of agreement between a new set of results and a historical database or a table of acceptable criteria for a given parameter. This is measured as percent difference (%D) from the reference value, and is primarily used by the laboratory as a means for documenting acceptability of continuing calibration.

The %D is calculated by expressing, as a percentage, the difference between the original value and new value relative to the original value. This method for precision measurement can be expressed by the formula:

$$\%\,D = \frac{C_1 - C_2}{C_1} \times 100$$

Where:

C_1 = Concentration of analyte in the initial aliquot of the sample.

C_2 = Concentration of analyte in replicate.

The laboratory will review the QC samples and surrogate recoveries for each analysis to ensure that the %R lies within the control limits listed in the UFP-QAPP. Otherwise, data will be flagged by the laboratory.

For field measurements such as pH, accuracy is often expressed in terms of bias (B) and is calculated as follows:

$$B = M - A$$

Where:

M = Measured value of Standard Reference Material (SRM)
A = Actual value of SRM

Sensitivity

Sensitivity is the ability of the analytical test method and/or instrumentation to differentiate between detector responses to varying concentrations of the target constituent. Methodology to establish sensitivity for a given analytical method or instrument includes examination of standardized blanks, instrument detection limit studies, and calibration of the QL. The findings of the usability of the data relative to sensitivity will be included in the report, including any limitations on the data set and/or individual analytical results.

The Precision, Accuracy, Representativeness, Completeness, Comparability and Sensitivity MPC are described in the following steps will be performed:

- Evaluate if the project required quantitation limits were achieved for non-detected site contaminants. If no detectable results were reported and data are acceptable for the verification and validation steps, then the data are usable.
- If detectable concentrations are reported and the verification and validation steps are acceptable, the data are usable.
- If verification and validation are not acceptable, the data are qualified, estimated (J, UJ) for minor QC deviations that do not affect the data usability, or rejected for major QC deviations affecting data usability. The impact of rejected data will be evaluated and re-sampling may be necessary. Use of estimated data will be discussed in the project report.
- For statistical comparisons and mathematical manipulations, non-detect values will be represented by a concentration equal to one-half the sample-specific reporting limit. Duplicate results (original and duplicate) will not be averaged for the purpose of

representing the range of concentrations. However, the average of the original and duplicate will be used to represent the concentration at that sample location.

Statistical tests will be conducted to identify potential outliers. Potential outliers will be removed if a review of the field and laboratory documentation indicates that the results are true outliers.

Method sensitivity is typically evaluated in terms of the method detection limit (MDL) and is defined as follows for many measurements:

$$MDL = {}^{t}(n - 1, 1 - \alpha = 0.99)\,(s)$$

Where:

s = Standard deviation of the replicate analyses
$^{t}(n - 1, 1 - \alpha = 0.99)$ = Student's t-value for a one-sided 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom
n = Number of measurements
α = Statistical significance level

Representativeness

Representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. It is a qualitative parameter that depends on proper design of the sampling program.

Data representativeness for this project is accomplished by implementing approved sampling procedures and analytical methods that are appropriate for the intended data uses, and which are established within the site-specific SAP, and/or QAPP.

Field personnel will be responsible for collecting and handling samples according to the procedures in this UFP-QAPP and the site-specific SAP, and/or QAPP so that samples are representative of field conditions. Errors in sample collection, packaging, preservation, or chain-of-custody procedures may result in samples being judged non-representative and may form a basis for rejecting the data.

Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another, whether it was generated by a single laboratory or during inter-laboratory studies. The use of standardized field and analytical procedures ensures comparability of analytical data. Sample collection and handling procedures will adhere to U.S. EPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units, use standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements.

Completeness

Project-specific completeness goals account for all aspects of sample handling, from collection through data reporting. The level of completeness can be affected by loss or breakage of samples during transport, as well as external problems that prohibit collection of the sample. The following calculation is used for determining the percent complete:

$$\text{Completeness} = \frac{A}{B} \times 100$$

Where:

A = Actual number of measurements judged valid (the validity of a measurement result is determined by judging its suitability for its intended use)
B = Total number of measurements planned to achieve a specified level of confidence in decision making

The formula for sampling completeness is:

$$\text{Sampling Completeness} = \frac{\text{Number of locations sampled}}{\text{Number of planned sample locations}} \times 100$$

An example formula for analytical completeness is:

$$\text{Metals Analytical Completeness} = \frac{\text{Number of Usable Data Points}}{\text{Expected Number of Usable Data Points}} \times 100$$

The ability to meet or exceed completeness objectives is dependent on the nature of samples submitted for analysis.

Graphics

Graphic figures will be generated to depict sample locations, as needed. Also, if necessary, figures will be generated to represent contaminant concentrations at each sampling location. Each figure will contain a detailed legend.

Reconciliation

PQOs will be examined to determine if the objective was met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of the major impacts observed from the data verification and validation, DQIs, and MPC assessments. Based on the results of these assessments, the quality of the data will be determined. Based on the quality determined, the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective, it will be determined if the PQO was met and whether project action limits were exceeded. As part of the reconciliation of each objective, conclusions will be drawn, and any limitations on the usability of any of the data will be described.

6. QUALITY ASSURANCE

An EPA Region 6 Quality Control (QC) Officer will be assigned and will monitor work conducted throughout the entire project including reviewing interim report deliverables and field audits. The START PTL will be responsible for QA/QC of the field sampling and monitoring activities. The designated laboratory utilized during the investigation will be responsible for QA/QC related to the analytical work. START personnel will also collect samples to verify that laboratory QA/QC is consistent with the required standards and to validate the laboratory data received.

6.1 SAMPLE CUSTODY PROCEDURES

Because of the evidentiary nature of sample collection, the possession of samples must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. After sample collection and identification, samples will be maintained under chain-of-custody (COC) procedures. If the sample collected is to be split (laboratory QC), the sample will be allocated into similar sample containers. Sample labels completed with the same information as that on the original sample container will be attached to each of the split samples. Personnel required to package and ship coolers containing potentially hazardous material will be trained accordingly.

START personnel will prepare and complete chain-of-custody forms using the Scribe Environmental Sampling Data Management System (SCRIBE) for all samples sent to a START designated off-site laboratory. The chain-of-custody procedures are documented and will be made available to all personnel involved with the sampling. A typical chain-of-custody (COC) record will be completed each time a sample or group of samples is prepared for shipment to the laboratory. The record will repeat the information on each sample label and will serve as documentation of handling during shipment. A copy of this record will remain with the shipped samples at all times, and another copy will be retained by the member of the sampling team who originally relinquished the samples. At the completion of the project, the data manager will export the SCRIBE COC documentation to the Analytical Service Tracking System (ANSETS) database.

Samples relinquished to the participating laboratories will be subject to the following procedures for transfer of custody and shipment:

- Samples will be accompanied by the COC record. When transferring possession of samples, the individuals relinquishing and receiving the samples will sign, date, and note the time of the sample transfer on the record. This custody records document transfer of sample custody from the sampler to another person or to the laboratory.
- Samples will be properly packed for shipment and dispatched to the appropriate laboratory for analysis with separate, signed custody records enclosed in each sample box or cooler. Sample shipping containers will be custody-sealed for shipment to the laboratory. The preferred procedure includes use of a custody seal wrapped across filament tape that is wrapped around the package at least twice. The custody seal will then be folded over and stuck to the seal to ensure that the only access to the package is by cutting the filament tape or breaking the seal to unwrap the tape.
- If sent by common carrier, a bill of lading or airbill will be used. Bill of lading and airbill receipts will be retained in the project file as part of the permanent documentation of sample shipping and transfer.

6.2 PROJECT DOCUMENTATION

Field observations will be recorded legibly and in ink and by entry into field logbooks, Response Manager, or SCRIBE. Response Manager is the Enterprise Data Collection System designed to provide near real-time access to non-analytical data normally collected in logbooks. Response Manager provides a standard data collection interface for modules of data normally collected by START field personnel while on-site. These modules fall into two basic categories for Response and Removal. The modules include Emergency Response, Reconnaissance, Facility Assessment, Shipping, Containers, Materials, Calls, HHW, and General/Site Specific data. The system provides users with a standard template for laptop/desktop/tablet PCs that will synchronize to the secure web interface using merge replication technology to provide access to field collected data via on the Regional Response Center Enterprise Data Management System (RRC-EDMS) EPA Web Hub. Response Manager also includes a PDA application that provides some of the standard data entry templates from Response Manager to users for field data entry. Response Manager also includes an integrated GPS unit with the secure PDA application, and the coordinates collected in Response Manager are automatically mapped on the RRC-EDMS interactive mapping site. GIS personnel can then access this data to provide comprehensive site maps for decision-making support.

Response Manager also includes an Analytical Module that is designed to give SCRIBE users the ability to synchronize the SCRIBE field data to the RRC-EDMS Web Hub. This allows analytical data managers and data validators access to data to perform reviews from anywhere with an Internet connection. The Analytical Module is designed to take the analytical data entered into EPA SCRIBE software and make it available for multiple users to access on one site. START personnel will utilize SCRIBE for data entry on-site and will upload to the Response Manager Analytical module.

6.2.1 Field Documentation

The following field documentation will be maintained as described below.

Field Logbook. The field logbook is a descriptive notebook detailing site activities and observations so that an accurate, factual account of field procedures may be reconstructed. Logbook entries will be signed by the individuals making them. Entries should include, at a minimum, the following:

- Site name and project number.
- Names of personnel on-site.
- Dates and times of all entries.
- Description of all site activities, including site entry and exit times.
- Noteworthy events and discussions.
- Weather conditions.
- Site observations.
- Identification and description of samples and locations, including Latitudes and Longitudes
- Subcontractor information and names of on-site personnel.
- Dates and times of sample collections and chain-of-custody information.
- Records of photographs.
- Site sketches of sample location including identification of nearest roads and surrounding developments.
- Calibration results.

- Changes from the sampling plan

Sample Labels. Sample labels will be securely affixed to the sample container. The labels will clearly identify the particular sample and include the following information:

- Site name and project number.
- Date and time the sample was collected.
- Sample preservation method.
- Analysis requested.
- Sampling location.

Chain-of-Custody Record (COC). A COC will be maintained from the time of sample collection until final deposition. Every transfer of custody will be noted and signed for and a copy of the record will be kept by each individual who has signed it.

Custody Seal. Custody seals demonstrate that a sample container has not been tampered with or opened. The individual who has custody of the samples will sign and date the seal and affix it to the container in such a manner that it cannot be opened without breaking the seal.

Photographic Documentation. START will take photographs to document site conditions and activities. Photographs should be taken with either a film camera or digital camera capable of recording the date on the image. Each photograph will be recorded in the logbook and within Response Manager with the location of the photographer, direction the photograph was taken, the subject of the photograph, and its significance (i.e., why the picture was taken). Where appropriate, the photograph location, direction, and subject will also be shown on a site sketch and recorded within Response Manager.

6.2.2 Report Preparation

At the completion of the project, START will review and validate laboratory data and prepare a draft report of field activities and analytical results for EPA OSC review. Draft deliverable documents will be uploaded to the EPA TeamLink website for EPA OSC review and comment.

6.2.3 Response Manager

START will use the Response Manager module located on the EPA Web Hub to collect and organize the data collected from project activities. The information to be included encompasses some or all of the following depending on the specific project needs:

- General Module – Site specific data including location and type of site. It also includes an area for key site locations including geo-spatial data associated with the key site locations.
- Emergency Response Module – includes the following sub-modules: Basic Info, HAZMAT, Release, Time Line Log, Incident Zones, Photos, Sensitive Receptors, Evacuations, Source, Cause, and Weather.
- Reconnaissance Module – provides standard templates with the flexibility of adding any additional questions of values to the drop-down lists for targeted reconnaissance efforts. Typically the data in this module is associated with ESF-10 deployments and the clean-up of orphaned containers and hazardous debris, but the module can be utilized for any and all reconnaissance activities.
- Facility Assessment Module – provides standard templates with the flexibility of adding any additional questions of values to the drop-down lists for assessments of structures. This is typically utilized for EPA regulated program facilities during an ESF-10 deployment of resources. This module can be utilized to track the assessment of any facilities including multiple assessments of the fixed facilities.
- Shipping Module – provides standard templates for creating a cradle-to-grave record of waste shipments from the site until they are recycled or destroyed. This includes the ability to capture manifests and manifest line items and to upload photos/original documents to support the records.
- Container Module – provides standard templates for cataloguing containers including HAZCAT and Layer information in each container. The module also allows for the tracking of which containers are bulked.
- Properties Module – provides standard templates with the flexibility of adding any additional questions of values to the drop-down lists for collection of property data including access agreements and assessments of the property and current status of property regarding the site removal action.
- Materials Module – provides standard templates for tracking materials that are brought on-site or that are removed from the site.
- Daily Reports – provides standard templates for tracking daily site activities, daily site personnel, and daily site notes for reporting back to the EPA OSC in a POLREP or SITREP.
- Household Hazardous Waste Module (HHW) – provides standard templates with the flexibility of adding any additional questions of values to the drop-down lists for tracking the amount of HHW collected at individual collection stations by HHW type.
- Data Files – data files can be uploaded in the photo-module section and be associated with

individual records or with the site in general. The metadata associated with that data file can be filled in using the photo log fields.

The data stored in the Response Manager database can be viewed and edited by any individual with access rights to those functions. At anytime deemed necessary, Pollutions Reports (POLREPs) and/or Situation Reports (SITREPs) can be generated by exporting the data out of Response Manager into Microsoft Excel/Word. The database is stored on a secure server and backed up regularly.

Appendix B

PROJECT ACTION LIMITS AND LABORATORY-SPECIFIC DETECTION/QUANTITATION LIMITS

The following information will be provided for each matrix, analyte, analytical method, and concentration level (if applicable).

Matrix: Water
Analytical Method: 200.7, 200.8, 245.1
Concentration level (if applicable): Low to High

Analyte	EPA Tapwater (µg/L)	PAL Reference[1]	Project Quantitation Limit (PQL) Goal	Laboratory Quantitation Limit (LQL)[2, 3]	Laboratory Detection Limit (LDL)[2, 3]
Total Metals					
Aluminum	20000	EPA RSL Table	TBD	TBD	TBD
Antimony	7.8	EPA RSL Table	TBD	TBD	TBD
Arsenic	0.052	EPA RSL Table	TBD	TBD	TBD
Barium	3800	EPA RSL Table	TBD	TBD	TBD
Beryllium	25	EPA RSL Table	TBD	TBD	TBD
Cadmium	9.2	EPA RSL Table	TBD	TBD	TBD
Calcium	NE	EPA RSL Table	TBD	TBD	TBD
Chromium	NE	EPA RSL Table	TBD	TBD	TBD
Cobalt	6	EPA RSL Table	TBD	TBD	TBD
Copper	800	EPA RSL Table	TBD	TBD	TBD
Iron	14000	EPA RSL Table	TBD	TBD	TBD
Lead	15	EPA RSL Table	TBD	TBD	TBD
Magnesium	NE	EPA RSL Table	TBD	TBD	TBD
Manganese	430	EPA RSL Table	TBD	TBD	TBD
Mercury	0.63	EPA RSL Table	TBD	TBD	TBD
Molybdenum	100	EPA RSL Table	TBD	TBD	TBD
Nickel	NE	EPA RSL Table	TBD	TBD	TBD
Potassium	390	EPA RSL Table	TBD	TBD	TBD
Selenium	100	EPA RSL Table	TBD	TBD	TBD
Silver	94	EPA RSL Table	TBD	TBD	TBD
Sodium	NE	EPA RSL Table	TBD	TBD	TBD
Thallium	0.2	EPA RSL Table	TBD	TBD	TBD
Vanadium	86	EPA RSL Table	TBD	TBD	TBD
Zinc	6000	EPA RSL Table	TBD	TBD	TBD

Dissolved Metals					
Aluminum	NE	EPA RSL Table	TBD	TBD	TBD
Antimony	NE	EPA RSL Table	TBD	TBD	TBD
Arsenic	NE	EPA RSL Table	TBD	TBD	TBD
Barium	NE	EPA RSL Table	TBD	TBD	TBD
Beryllium	NE	EPA RSL Table	TBD	TBD	TBD
Cadmium	NE	EPA RSL Table	TBD	TBD	TBD
Calcium	NE	EPA RSL Table	TBD	TBD	TBD
Chromium	NE	EPA RSL Table	TBD	TBD	TBD
Cobalt	NE	EPA RSL Table	TBD	TBD	TBD
Copper	NE	EPA RSL Table	TBD	TBD	TBD
Iron	NE	EPA RSL Table	TBD	TBD	TBD
Lead	NE	EPA RSL Table	TBD	TBD	TBD
Magnesium	NE	EPA RSL Table	TBD	TBD	TBD
Manganese	NE	EPA RSL Table	TBD	TBD	TBD
Mercury	NE	EPA RSL Table	TBD	TBD	TBD
Nickel	NE	EPA RSL Table	TBD	TBD	TBD
Potassium	NE	EPA RSL Table	TBD	TBD	TBD
Selenium	NE	EPA RSL Table	TBD	TBD	TBD
Silver	NE	EPA RSL Table	TBD	TBD	TBD
Sodium	NE	EPA RSL Table	TBD	TBD	TBD
Thallium	NE	EPA RSL Table	TBD	TBD	TBD
Vanadium	NE	EPA RSL Table	TBD	TBD	TBD
Zinc	NE	EPA RSL Table	TBD	TBD	TBD

[1] State regulatory cleanup standards will be provided in an updated QAPP.

[2] Terminology is project/laboratory-specific.